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SUBJECT: Radioactivity in Clinch River Water

TO: A. F. Becher

FROM: K. Z. Morgan

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To: D. M. Davis
J. C. Hart

From: Environmental Monitoring Group

Subject: Radioactivity in Clinch River Water

Enclosed, Table I, are the results of analysis of the weekly composite Clinch River samples which were collected at the ORGDP water filtration plant intake, by ORGDP personnel, for ORNL. $(MPC)_w$ values for the mixture have been calculated and are included in this table. Also enclosed, Tables II and III respectively, are the dilution factors in the Clinch River during the period 4/1/62 - 4/29/62 and the radiochemical analysis of White Oak Lake effluent, April, 1962. The $(MPC)_w$ values in Table I are based on the isotopic distribution at ORGDP, and the recommendations of the NCRP for the neighborhood of a controlled area (1/10 occupational level). The composition shown in Table III has an $(MPC)_w$ of 1.8×10^{-6} $\mu\text{c}/\text{cm}^3$ according to the recommendation of the ICRP and NCRP for large population groups (1/30 of the occupational level). If the recommendation of the FRC on Sr^{90} , Sr^{89} , and I^{131} are used, a slightly higher $(MPC)_w$ of 2.5×10^{-6} $\mu\text{c}/\text{cm}^3$ is obtained.

The concentration of radionuclides in the river, shown in Table I, continued to remain at approximately 27% of the maximum permissible during the first two weeks in April. (This value was first reached during the week ending 4/1/62.) This was due largely to the limited discharge from Norris Dam and the subsequent low dilution afforded by the river. The value returned to approximately 9% by the end of the month. A total of 146 curies of radioactivity was discharged from White Oak Lake during April.


W. D. Cottrell

WDC:dw

Enclosures

TABLE I
RADIOACTIVITY IN THE CLINCH RIVER AT ORGDP FILTRATION PLANT
April, 1962

Sample No.	Week Ending	Gross Beta c/m/ml ^a	Gross Alpha c/m/ml ^b	Sr Beta x 10 ⁻⁸ µc/ml	Ru Beta x 10 ⁻⁶ µc/ml	(MPC) _w ^c x 10 ⁻⁶ µc/ml	% (MPC) _w
G-106	4-8-62	0.28 ± 0.008	0.01	1.76 ± 0.14	0.92 ± 0.014	3.22	27.0
G-107	4-15-62	0.093 ± 0.005	0.01	2.57 ± 0.18	0.28 ± 0.009	1.02	28.0
G-108	4-22-62	0.093 ± 0.005	0.01	1.67 ± 0.14	0.29 ± 0.009	1.49	19.0
G-109	4-29-62	0.034 ± 0.003	0.01	0.86 ± 0.09	0.10 ± 0.005	1.15	9.1

^aGross beta counted at 14.6% geometry based on Ru¹⁰⁶ as a standard.

^bGross alpha counted at 52% geometry.

^cMaximum permissible concentration for populations in the neighborhood of a controlled area.

TABLE II
Dilution Factor¹ in the Clinch River During
the Period 4/1/62 - 4/29/62

<u>Week Ending</u>	<u>Weekly Average</u>
4-8-62	1:94
4-15-62	1:68
4-22-62	1:259
4-29-62	1:752

¹The dilution factor is defined as the ratio of the volume, or quantity, of water flowing from White Oak Creek into Clinch River, to the volume, or quantity, of water in the Clinch River flowing past mile 20.8 (the mouth of White Oak Creek) during the specified period.

TABLE III

Radiochemical Analyses of White Oak Lake Effluent
April, 1962

<u>Isotope</u>	<u>% of Total</u>
Ru ¹⁰⁶	95.41
Zr ⁹⁵	0.07
Tre-Ce*	1.74
Cs ¹³⁷	0.26
I ¹³¹	0.02
Ce ¹⁴⁴	0.16
Nb ⁹⁵	0.11
Ba ¹⁴⁰	0.02
Co ⁶⁰	1.11
Sr ⁸⁹	0.11
Sr ⁹⁰	1.00

Total curies - 146

*Total rare earths, minus Cerium.